THE OUTCROP BELT OF THE EAST KENTUCKY COAL FIELD.

(*To accompany a Map presented to the American Philosophical Society, June 20th*, 1873.)

By Joseph Lesley,

Late Assistant on the Kentucky Geological Survey.

Under appointment of David Dale Owen, State Geologist of Kentucky, I began, on the 25th of August, 1858, a Geological and Topographical Survey of the margin of the Eastern Coal Field of the State, to determine its area, and the number, thickness and attitude of its beds of coal and iron ore; and to get a reliable base for a future survey of the whole Eastern Coal Field, as far as to the Virginia line.

The base line of my survey was run upon the common roads of the country; flying side lines, and in some cases closed looped lines, being carried out sideways to the western outcrops wherever necessary.

An admirably constructed odometer was used for measuring distances, and a compass with side-telescope and eccentric target for running courses. Aneroid observations, regularly taken at every station, were checked by clinometric measurements made with a vertical circle attached to the telescope; and also by synchronous observations with a barometer stationary in camp.

The main base line was also carefully leveled for a distance of about two hundred miles with a spirit-level, which was also used on some of the side lines, in order to tie the parts of the work together, and to give the exact datum above tide-water for all principal stations, in view of adopting them as starting points of the contemplated survey of the whole coal field.

The work thus described was continued from September 1, 1858, to November 1, 1859, seven months being passed in field work, and with the following results:

1st. A large contour-line map was made on a scale of three miles to the inch, which has never been published. The original plottings were on a scale of five hundred feet to the inch. This map includes only the ground covered by the survey, and shows the positions of towns, county-line crossings, coal openings and other points of interest, as well as the crossing of the long east and west base line run by S. S. Lyon, Assistant on the State Geological Survey.

2d. The map now published for the first time, to accompany this description, was compiled from the survey sheets of the first-named map, from old maps in the Internal Improvement Office, from railway surveys, and from the old State map.

3d. A base line for future use, extending in a general southwest direction along the strike of the formations, beginning at a point five hundred and ninety-seven feet above tide, close by the town of Grayson, in Carter


Map of Eastern Ken
shewing the Western Outcrop of its Coal
as determined by the surveys of 1858 and 1859
CINCINNATI
COVINGTON
NEWPORT
BURLINGTON
BOONE
KENTON
WARSAW
GALLATIN
GRANT
PENDLETON
BRACKEN
MAYSVILLE
PORTSMOUTH
FALMOUTH
BROOKVILLE
CLARKSBURG
MASON
LEWIS
Big Lick
WILLIAMSTOWN
OWENTON
OWEN
HARRISON
FLEMINGSBURG
FLEMING
Poplar Plains
GRAYSON
CYNTHIANA
CARLISLE
ROWAN
MOOREHEAD
CARTER
SCOTT
GEORGETOWN
FRANKFORT
PARIS
BOURBON
BATH
OWINGSVILLE
MONTGOMERY
MT STERLING
WOODFORD
VERSAILLES
LAWRENCEBURG
LEXINGTON
WINCHESTER
Jeffersonville
W. LIBERTY
FAYETTE
CLARKE
Red River I. W.
MORGAN
STANTON
POWELL
HAZLEGREEN
NICHOLASVILLE
JESSAMINE
MERCER
HARRODSBURG
MADISON
RICHMOND
Estill Sprs.
IRVINE
ESTILL
GARRARD
DANVILLE
BOYLE
LANCASTER
JACKSON
BREATHITT
BOONVILLE
OWSLEY
Big Hill
STANFORD
LINCOLN
Crab Orchard
MCKEE
JACKSON
MT VERNON
ROCKCASTLE
Waynesburg
LIBERTY
CASEY
HAZARD
PERRY
LAUREL
CLAY
MANCHESTER
Mt Gilead
LONDON
PULASKI
SOMERSET
RUSSELL
JAMESTOWN
MT. PLEASANT
BARBOURVILLE
HARLAN
KNOX
PROPOSED
MONTICELLO
WAYNE
WILLIAMSB.
NEW
WHITLEY


Map of Eastern Kentucky,
shewing the Western Outcrop of its Coal Field
as determined by the surveys of 1858 and 1859.
by
Jos. Lesley, Jr.
PORTSMOUTH
MAYSVILLE
BROOKVILLE
MASON
CLARKSBURG
LEWIS
GREENUPSBURG
Hanging Rock
Ironton
FLEMINGSBURG
FLEMING
Poplar Plains
Olive Hill P.O.
GRAYSON
CARLISLE
ROWAN
CARTER
MOOREHEAD
OWINGSVILLE
BATH
LAWRENCE
MT STERLING
MONTGOMERY
Jeffersonville
W. LIBERTY
JOHNSON
Burning Spring
Red River I. W.
STANTON
POWELL
MORGAN
HAZLEGREEN
PAINTVILLE
PRESTONSBURG
FLOYD
Estill Sprs.
IRVINE
ESTILL
JACKSON
PIKE
PIKEVILLE
BOONVILLE
OWSLEY
BREATHITT
MCKEE
HAZARD
LETCHER
Sounding Gap
WHITESBURG
LONDON
MANCHESTER
CLAY
LAUREL
PERRY
Stoney Gap
MT. PLEASANT
BARBOURVILLE
HARLAN
KNOX
WILLIAMSB.
Scale of

Photo lith. by I. Renn, Phi


Shewing the Western Outcrop of its Coal Field
as determined by the surveys of 1858 and 1859.
by
Jos. Lesley, Jr.
Topographical Assistant
PORTSMOUTH
MAYSVILLE
BROOKVILLE
CLARKSBURG
GREENUPSBURG
Hanging Rock
Ironton
Catlettsburg
MASON
LEWIS
GREENUP
FLEMINGSBURG
Poplar Plains
Cain Hill P.O.
GRAYSON
CARTER
CARLISLE
FLEMING
ROWAN
MOOREHEAD
LAWRENCE
LOUISA
Burning Spring
OWINGSVILLE
BATH
MONTGOMERY
MT. STERLING
Jeffersonville
W. LIBERTY
JOHNSON
MORGAN
PAINTVILLE
Red River I.W.
STANTON
POWELL
HAZLEGREEN
State House
PRESTONSBURG
FLOYD
PIKE
Estill Spgs.
IRVINE
ESTILL
JACKSON
BREATHITT
ROONVILLE
PIKEVILLE
McKEE
OWSLEY
HAZARD
PERRY
LETCHER
Sounding Gap
WHITESBURG
LAUREL
CLAY
LONDON
MANCHESTER
Stoney Gap
MT. PLEASANT
BARBOURVILLE
KNOX
HARLAN
WILLIAMSB.
Scale of
0
6
12
18
24
30
36
Cumberland Gap
Photo lith. by J. Rowan, Phila.

county, Northeast Kentucky, and extending, by a loop embracing a section covered by the Little Sandy River and its tributaries, to the ridge dividing Carter from Rowan counties; thence, across the east end of Bath county to Jeffersonville, in Montgomery County; thence, to the Red River Iron Works on the edge of Estill county; thence, to the town of Proctor and its coal mines on the Kentucky River; thence, across Owsley county to McKee in Jackson county; thence, to Mt. Vernon in Rock Castle county, and Somerset in Pulaski county; thence, across the Cumberland River at the "lower ford" to Monticello in Wayne county; and thence, to its southern terminus on the Tennessee State-line in Clinton county, at a point on the waters of Wolf River, one thousand and nineteen feet above tide.

4th. The establishment of sixty-two bench marks, showing elevation above tide and above low water in the Ohio River at Catlettsburg.

5th. An unpublished geological section to accompany Map No. 1.

By observations made during the progress of the work, the following points of scientific interest present themselves:

1st. In approaching this coal field from Middle Kentucky, over the lower Silurian formations, one is confronted by a belt of cone-shaped hills having the Devonian black slates in their gently sloping bases, upon which rise steeper slopes of the olive-colored shales and overlying grit stones of the same system. These shales and grit stones together vary in thickness from three hundred and fifty to five hundred and fifty feet, the lower and larger division of the formation having disseminated through it nodular masses of earthy iron ore, giving origin to numerous chalybeate springs; the upper division affording valuable building stone.

Upon the above-named rocks lies the Mountain or Sub-carboniferous Limestone, varying in thickness from seventy feet at the north end of the line to four hundred feet and more at the southern end. This formation is composed of alternating layers of white, gray and buff-colored strata, ranging in quality from argillaceous claystone to the purest plaster limestone. The lowest members of the series hold large dark green flint pebbles, and exhibit traces of galena. Dry valleys and numerous caves distinguish this formation.

Above these limestones lies the Millstone Grit formation (the Conglomerate No. XII of the Pennsylvania Survey) in two members; the lower made up of thin sandstones and shales, enclosing beds of coal and iron ore. This is named the "Sub-conglomerate" member. The upper or "conglomerate" proper consists of a massive, coarse-grained ferruginous sandrock containing pebbles.

The two members of this formation thicken southwestwardly, as do also the rocks of the previously mentioned formations on which they repose, but under different and peculiar conditions.

At Grayson the whole formation measures ninety feet, with the "lowest" coal bed—a mere streak—jammed between its base and the top of the limestone.

At the north fork of Licking River the upper member is one hundred and fifty feet thick; while the lower one is only eight feet thick and contains a well-defined bed of iron ore and a twelve-inch coal-bed.

In Estill county the upper member measures two hundred feet; the lower has also increased to fifty feet, its accompanying ore bed being now workable; and its coal bed measuring twenty-seven inches in thickness.

From this last-named point to the south end of the line at the Tennessee State line the peculiar character of this formation shows itself in a marked manner; its lower member increasing to an average thickness of two hundred and twenty-five feet and containing two workable and three other thin beds of coal and three well-defined horizons of shale containing iron ore; its upper member nowhere exceeding eighty feet in thickness.

The point of sudden change lies geographically between the top of the ridge dividing the Red and Kentucky Rivers and the valley of the Kentucky River itself.

The "lowest" coal bed holds its place throughout the belt; the other sub-conglomerate coals, mentioned above, coming in one by one above it; and in proportion to the constant thickening of the lower member of the formation.

Back from the greatly eroded and boldly-rising wall of the Conglomerate, which always marks the western margin of the East Kentucky coal field, lie, thinly spread over a plateau trenched by ravines, the lowest layers of the Lower Coal Measures proper.

2d. All the formations mentioned above dip to the southeast, making the western side of a wide and shallow synclinal trough.

3d. This great wave, having its axis in a direction N.N.E. and S.S.W., is itself crossed by undulations of no great height and depth, having their axes W.N.W. and E.S.E. Gentle as those undulations were, they were quite sufficient to determine the principal lines of drainage which issue from the mountain country into the plain.

4th. All the formations examined along the base line thicken, and also rise above sea-level, going towards the southwest.

5th. The lowest sub-conglomerate coal varies in thickness, but is persistent throughout the whole extent of the belt surveyed, a distance of about two hundred miles.

6th. Different species of trees mark the outcrops of the different geological formations. The sugar-tree and other maples and the white oak are characteristic of the base of the Devonian "Knobstone" series. Beech and red cedar grow on the sub-carboniferous limestones. Pine, hemlock, laurel and holly possess the conglomerate cliffs and peaks. Chestnut and oak forests cover the shales and sandstones of the great plateau bordered by the conglomerate bluffs.